

OAK RIDGE NATIONAL LABORATORY

operated by

UNION CARBIDE CORPORATION NUCLEAR DIVISION



for the

U.S. ATOMIC ENERGY COMMISSION

ORNL-TM-1805

COPY NO. - 1 12

DATE - March 22, 1967

"PUT-5" AND "TAKE-5" — TWO MAGNETIC TAPE SYSTEMS ROUTINES FOR THE PDP-8

B. W. Rust[†] and W. R. Burrus

ABSTRACT

Two magnetic tape systems routines have been written to provide fast input of programs or data to a PDP-8 computer from a DEC type 580 tape transport. PUT-5 is used to create systems tapes containing the user's programs and TAKE-5 is used to read the programs into the computer from such systems tapes.

This Work Supported by NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Under Order R-104(1)

†Computer Technology Center, Oak Ridge Gaseous Diffusion Plant.

NOTICE This document contains information of a preliminary nature and was prepared primarily for internal use at the Oak Ridge National Laboratory. It is subject to revision or correction and therefore does not represent a final report.

N67-31743

(ACCESSION NUMBER)

(PAGES)

(PAGES)

(HASA CR OR TMX OR AD NUMBER)

LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

- A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or
- B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

PUT-5 and TAKE-5 are magnetic tape systems routines for use on a PDP-8 computer with a DEC Type 580 tape transport. Their purpose is to provide a fast means for loading programs into core. Each of them occupies all of the last page of core up to the CRIMP loader, leaving all of the first 31 pages for the programs to be loaded. Thus they occupy essentially the same space as the binary paper tape loader. PUT-5 is used to put the programs or data on tape and TAKE-5 is used to read them into core. Each time PUT-5 is used it "puts" a file on the systems tape. A file consists of three records:

- 1. an end of file,
- 2. a short ID record,
- 3. a long core image record.

The format of these records are such that they can be read with an IBM-7090 computer so that any systems tape made up with PUT-5 can easily be reproduced on the 7090. The end of file at the beginning of each file serves as a physical separation between the files. It is needed so that the act of "putting" a file on the tape does not erase part of the next file. The ID record is ll₈ words long and contains the file number, the lower and upper limits for loading at "take" time, indexing information to be used when "taking" and enough dummy words to make the record equivalent to three 7090 words. The core image record consists of 7601₈ PDP-8 words. The first is a dummy word which is needed to make the total number of words in the record an even multiple of 3 and hence an even number of 7090 words. The other 7600₈ words are the contents of the first 31 pages of core. All the files written by PUT-5 have this same format and the same length and so any file on the systems tape can be rewritten without altering any of the other files.

TAKE-5 is designed to read systems tapes of the type just described.

Although the core image record always contains the contents of locations

O--7577 at "put" time, TAKE-5 does not necessarily have to load all these
locations from tape at "take" time. Instead, the lower and upper limits

for loading must be specified at "put" time. These are then written in the

ID record which will be read before the core image record at "take" time.

Although it would be more desirable to be able to specify the loading limits at

"take" time there was not enough space available on the last page to do this

in TAKE-5. TAKE-5 does, however, halt after reading the ID record displaying

the lower and upper limits it has received from the ID record in the AC and

MQ respectively. The user may then change these loading limits if he very

carefully follows the instructions for doing this which are given in the

section on operating instructions.

These programs have been used successfully for several months to make and read systems tapes, and although they have performed successfully most of the time they occasionally have "blown up". On at least one occasion this was found to be due to flaws in the hardware. Although we think that the programs are free of logical flaws the user should be careful, especially since PUT-5 does not check itself.

OPERATING INSTRUCTIONS FOR PUT-5 AND TAKE-5

PUT-5: Put-5 loads into the last page from 7600 up to the CRIMP loader. (7600-7755)

- 1. Make sure it is loaded with the CRIMP loader.
- 2. Then start at 7600. Computer will halt, tape will rewind.
- 3. Wait till rewind complete.
- 4. Put file number in keys, and hit continue. Computer will halt again.
- 5. Put first address to be "put" in keys and hit continue. Computer will halt again.
- 6. Put last address to be "put" in keys and hit continue.

 (Do not "put" outside the range from 0 to 7577.)

 Then computer will "put" on tape and rewind. To put another file repeat the process beginning with Step 3.

TAKE-5: Take-5 loads into the last page from 7600 up to the CRIMP loader. (7600-7755)

- 1. Make sure it is loaded with the CRIMP loader.
- 2. Start at 7600. Tape will rewind, and computer will halt.
- 3. Wait until rewind complete.
- 4. Put file number in keys and continue.

 Computer will try to "take" the ID record and will stop with either an error code (2222 or 7777) in AC, or will stop with the first address in AC and last address in MQ. A stop with 2222 in the AC means parity error and 7777 means size error.*
- 5. If there was an error, hit continue to rewind and try again, starting with Step 3.
 If there was not error, hit continue and the core image record will be "taken".
- 6. If successful, tape will rewind and halt. To read another file repeat the process beginning at Step 3.

 If not successful, computer will halt with an error code (2222 or 7777) in the AC. Hit continue to rewind and try again starting with Step 3.

Note: If the user desires to change the loading limits he must interrupt the process after Step 4. At this point he must deposit the address of the new lower limit for loading in location 7746, the one's complement of the lower limit in location 7754, and the two's complement of the number of words he desires to load in location 7755. He must then restart the program at location 7643, and the program will then read the core image record loading between the new limits which he has specified.

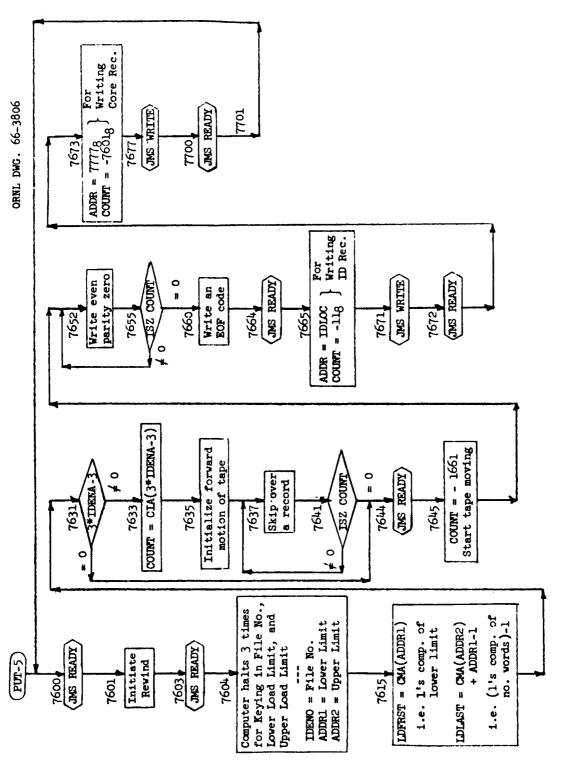


Fig. 1. Flow Diagram of PUT-5.

¢

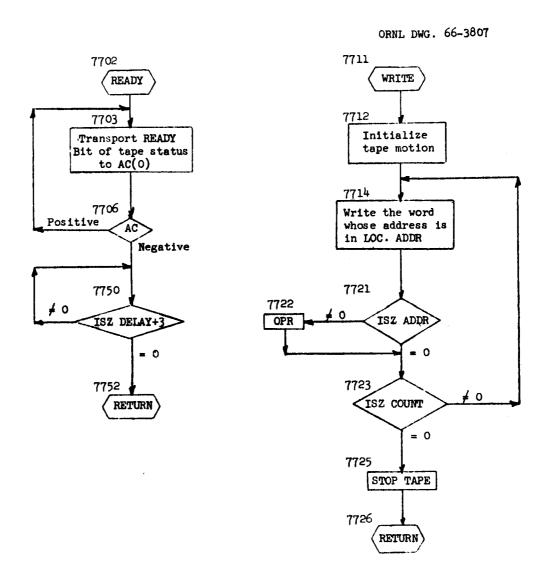


Fig. 2. Flow Diagrams of Subroutines Called by PUT-5.

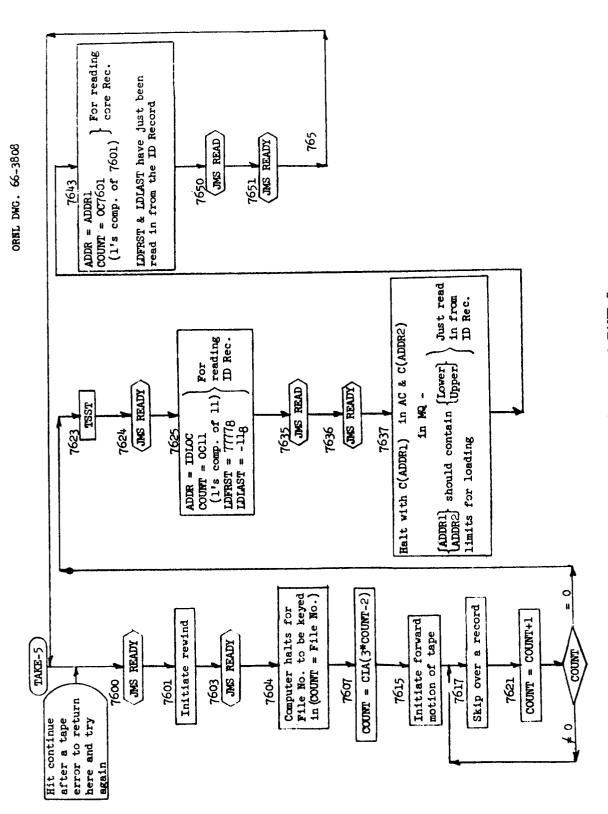


Fig. 3. Flow Diagram of TAKE-5.

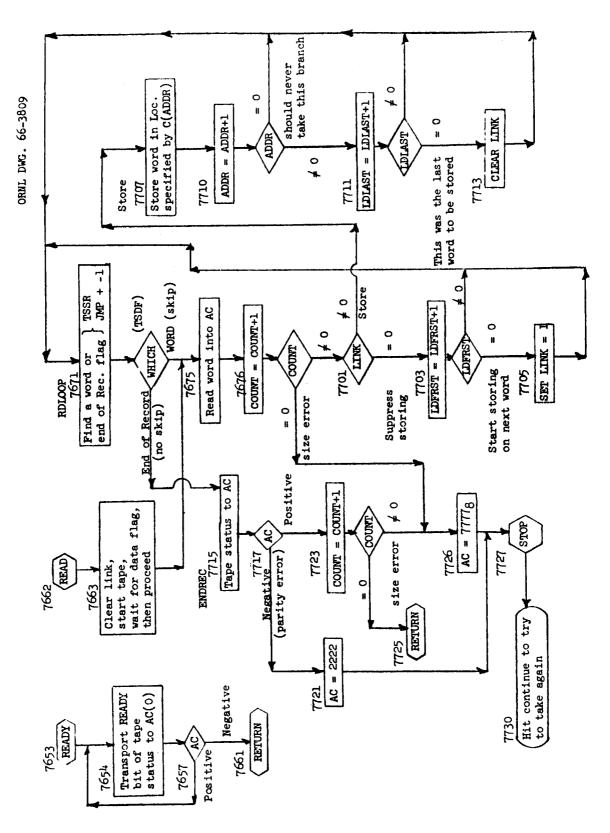


Fig. 4. Flow Diagram of Subroutines Called TAKE-5.

```
/PUTS -- THE FIFTH INTERIM MAGNETIC TAPE SYSTEM
                   WRITES A FILE ON TAPE IN FILE POSITION GIVEN BY KEY SWITCHES THE FILE CONSISTS OF |, AN EOF MARK
                                              2. A SHORT ID RECORD
3. A LONG CORE IMAGE RECORD
                                   THE 1D RECORD CONTAINS THE LOADING LIMITS FOR THE CORE IMAGE RECORD.
                           NOTE.
              *7600
7600
              PUT5.
                        JMS
                                 READY
                                          /REWIND THE TAPE
       4302
                        TAD
       1327
7601
                                 C0002
                       TIFM
7602
       6707
7603
       4302
                        JMS
                                 READY
                                          /STOP WITH GOOD IN AC / AND GET FILE NO. FROM SWITCHES
                       HLT CLA
7604
       7602
                       LAS
       7604
7605
7606
       3345
                       DCA
                                 1DENO
7607
7610
       7402
                       HLI
                                          /PICK UP FIRST ADDR. FOR CORE IMAGE REC. TO LOAD
       7604
7611
       3345
                       DCA
                                 ADDRI
                                               INTO WHEN READ BY TAKES.
7612
       7402
                        HLI.
                                               THEN STOP TO PICK UP
       7604
                                                   LAST ADDRESS TO LOAD INTO
7613
                       LAS
                       DCA.
                                 ADDR2
7.6 | 4
       3347
7615
       1346
                       TAD
                                 ADDRI
                                          TAKES REQUIRES ONES COMP. OF ADDRESTO BE READ
7616
       7040
                       CMA
       3354
                                 LDFRST
                                          / IN FROM ID RECORD
7617
                       DCA
                                           TAKERS REQUIRES THOS COMP. OF NO. WORDS TO
762n
       1347
                        TAD
                                 ADDR2
7621
       7040
                       CMA
                                          / BE LOADED.
                                 ADDR |
                       TAD
7623
       1346
                                          / ALSO TAKES WILL ADD I TO THIS NO. WHEN IT
                                          / READS THE ID. REC. SO MUST SUBTRACT | NOW. /MULT. NO. FILES BY 3 AND SUBTRACT 3 TO
7624
       3355
                       DCA
                                 LDLAST
7625
       1345
                       TAD
                                 IDENU
7626
       7144
                       CLL
                                             GET NO. RECS. TO SKIP
                                 IDEND
7627
       1345
                        TAD
763g
       1340
                        TAD
                                 M3
7631
       7450
                       SNA
       5244
                                 EOF
                                          /IF IST FILE IS THE ONE TO BE WRITTEN
7632
                       CIA
7633
       7041
7634
7635
                                 COUNT
                                           /-NO. RECORDS TO BE SKIPED
                       DCA
       3342
              SPACE,
                        TAD
TIFM
       1330
                                 C0530
7636
                                          /SKIP THE REQUIRED NO. OF RECS.
                       TCPI
7637
       6732
                        JMP
764n
       5237
                                 COUNT
7641
       2342
                       ISZ
                        JMP
7642
       5237
                                 , - 3
7643
       6724
                        TSST
              EOF.
                        JHS
7644
       43ü2
                                 READY
                                          /WRITE THE EOF
7645
                       TAD
                                 M1661
       1336
7646
       3342
                       DCA
                                 COUNT
                                          /1661 EVEN DENSITY O S IN EOF SPACE
7647
       1331
                       TAD
                                 C263U
765 n
      _67.µ7_
                       TIEM
7651
       7200
                       CLA
              SPCLP,
7652
       6716
                       TSWR
                                           / WRITE EVEN PARITY ZEROS
7653
       6721
                       TSDF
7654
       5253
                        JMP
7655
       2342
                       ISZ
                                 COUNT
7656
       5252
                        JMP
                                 SPCLP
7657
       1337
                       TAD
                                 EOFC
766n
       6716
                       TSWR
                                           / WRITE THE EOF MARK
766
      6721
                       TSDF
```

```
7662
       5261
                                .-1
                       JMP
7663
       6724
                       TSST
7664
                                4302
                       JMS.
                                IDLec
7665
                       TAD
       1333
                                ADDR
7666
       3343
                       DCA
                                MII
7667
       1334
                       TAD
7670
       3342
                       DCA
7671
       4311
                       JMS
                                WRITE
7672
                       JMS
                                READY
                                         INOW WRITE CORE RECORD
       4302
7673
                       CLA CMA
       7240
                                         /FIRST WRITE WORD 7777, THEN WORDS 0000=7577
7674
       3343
                       DCA
                                ADDR
7675
                       TAD
                                M7601
       1335
7676
                                COUNT
       3342
                       DCA
7677
                       JMS
                                WRITE
       4311
7700
7701
                                READY
PUT5
                       JMS
       4302
                       JMP
                                         /JUMP TO NORMAL STOP
       5200
7702
          0
             READY.
                        ŋ
7703
       7200
                       CLA
7704
7705
                       TSRS
                                /ACCUMULATOR = STATUS
       6734
7006
                       RTL
7706
       7700
                       SMA CLA
                                READY+2
.27 u 7
                       JMP
       5304
7710
       5702
                                READY
                       JMP
              WRITE.
7711
          0
                        0
7712
                       TAD
                                C2730
       1332
7713
       6707
                       TIFM
7714
       7200
              WLOOP.
                       CLA
7715
                                ADDR
       1743
                       TAD I
7716
7717
       6716
                       TSWR
       6721
                       T.SDF.
7720
       5317
                       JMP
7721
                       ISZ
                                ADDR
       2343
7722
       7000
                       OPR
                       ISZ
7723
                                COUNT
       2342
                                WLOOP
7724
       5314
                       JMP
7.725
       6724
                       TSST
7726
                       JMP I
                                WRITE
       5711
7727
          2
              COOUS.
                       0002
773n
        530
              C053g.
                       0530
7731
             C2630.
       2630
                       2630
7732
              C2730.
       2730
                       2730
7733
       7745
              IDLOG.
                       7745
7734
       7767
                       7767
              H11.
        177
7735
              M7601.
                       0177
7736
       6117
              M166;
                       6117
             ECFC,
                         17
7737
         17
7740
       7775
                       7775
              М3.
7741
       7777
              MI.
                       7777
7742
              CHUNT
                        ___0
         __0
7743
              ADDR,
                          0
              *7745
7745
7746
              IDENC.
          0
                          0
7747
          0
              ADDR2.
                       SPR
       7000
7750
                       SPR
7751
       7000
7752
       7000
                       OPR
7753
                         0
          0
              IDEN6.
7754
             LDFRST.
```

	7755	0	LDLAST	•	0	
	SYMROL	TABLI	Ę.			
	ADDR		743			
	ADURI		746			
	ADUR2		747			****
	C00n2 C0530	,	727 730			
	C263U		731			
	C2730		732			
	COUNT	7	742			
	EOF		544			
	EOFC		737			
	IDENO IDEN6		745 753			
	IDLAC		733			
	LDFRST		754			
	LDLAST		755			
	MI		741			
	MILL.	7	734			
	M1661	7	736			
	M3		740			
	M7681		735			
	PUTS		600			
	READY Space		702 635			
	SPCLP		652			
	MLOOP		714			
***	WRITE		711			
	DUPLICA	TE T	AGS			
	NONE					
	UNDEFIN	ED S	YMBOLS			

		TAKES .	THE 51	TH INTER	IM MAGNETIC TAPE SYSTEM	
 		/			RECORD AND DATA RECORD FROM FILE POSITION	
		/	GIVEN	BA KEA	SWITCHES	
		/				
		*7688				
760n	4253	START,	JMS	READY	Delication Tile TABP	
 7601	1331		TAD	C0005	/REWIND THE TAPE	
7602	6747		TIFM			
7603	4253		JMS	READY	•	
7604	7402		HLT	,,_,,		
7605	7604		LAS		/PICK UP FILE NO.	
7606	3337		DCA	COUNT		
 7607	1337		TAD	COUNT	MULTIPLY IT BY 3 AND SUBTRACT 2 TO GET	
76 L ŋ	7104		CLL RAL		/ NO. OF RECORDS TO SKIP	_
7611	1337		T A D	COUNT		
7612	1342		TAD	M2		
7613	7041		CIA			
 7614	3337		DCA	COUNT		
94:-		/	* 4 D	C0570	/SPACE OVER TO DESIRED ID RECORD	
7615	1332		TAD	C0530	ANALYTE OFFU TO DESTREET THE MEGOKA	
7616	6707		TIFM			
. 7617 762n	6732 5217		_TCPI	, • į		
7621	2337		ISZ	COUNT		
 7622	5217		JMP	. • 3		
7623	6724		TSST	• •		
20	- x ,	/	.,			
 7624	4253		JMS	READY		
7625	1343		TAD	IDLOC	/READ IN THE ID RECORD 9 WORDS IN ALL	
 7626	3340		DCA	ADDR		
7627	1334		TAD	9C11		
 763n	3337		DCA	COUNT		
7631	7040		CMA	LDEGGE		
 7632	3354		DCA.	LDFRST	y max in the control of the control	
7633	1341		TAD	MII LDLAST		
 7634	3355		DCA JMS	READ		
7635 .7636	4262 4253		JMS	READY		
 .7000	7270	/	3.10	11-11-1		-
7637	1347		TAD	ADDR2		
 7640	7421		MOL	=		
 764	1346		TAD	ADDR		
7642	7402		HLT	•	STOP DISPLAYING ADDRESSES OF FIRST AND LA	
•		/			/ LECATIONS TO LEAD DATA INTO FROM CORE	IMAGE
		/			/ RECORD.	** **
7643	7200		CLA		CHANGE LOAD ADDRESSES AT YOUR OWN RISK.	TO DO .
7644	1746		TAD	ADDRI	/ SO YOU MUST CHANGE ADDRIA LDFRST AND	DIAST
 	1346			ADDR	THIT CONTINUE TO READ CORE IMAGE RECORD	
7645 7646	3340 1335		DCA TAD	5C7601	ANT ACCULATE TO WEND CAME TANGE MECOND	
7647	3337		DCA	COUNT		
7650	4262		JMS	READ		
765	4253		JMS	READY		
7652			JMP	START		
 					The second secon	
7653	а	READY.	0000		SUBROUTINE FOR WAITING UNTIL TAPE READY	
7654	7200		CLA			
7655	6734		TSRS		/STATUS TO AC	
7656	7006		RTL			
7657			SMA CLA		/SKIP IF TRANSPORT READY	

7660 5295 JMP 1-3 7661 5295 JMP 1 READY / RETURNS WITH AC CLEARED 7667 76 JD 30 ST 10 C257	766n	5255		1 M D		3	
7662 0 READ 0000		-		-	,	-	A DETHONS WITH AC CLEARED
7645 7100 GLL / ADDN SHOULD CRNTAIN ADDR. OF IST LOC. TO 7640 6707 TIPH 7640 FOR	7001	2023	/	JMF	•	READI	A REJURNS WITH NO DECIMED
7664 1333 TAD C297U /ACTUALLY STORE DATA INTO	7662	0	READ,	0000			
7665 6707 TIFM	7663	7100					
7605 6721 TSDF						C2570	/ ACTUALLY STORE DATA INTO,
10 ACTUALLY STORE 10 A	-				M		
7670 5275 7671 5272 RDL60P, TSSR 7672 5271 JMP .** 7673 6725 5271 JMP .** 7673 5315 JMP .** 7674 5315 JMP .** 7675 7675 5301 JMP .** 7676 2337 JMP .** 7700 5326 JMP .** 7701 7430 SZL 7702 5307 JMP .** 7703 5307 JMP .** 7704 5271 JMP RDL60P 7704 5271 JMP RDL60P 7705 5271 JMP RDL60P 7705 5271 JMP RDL60P 7706 5271 JMP RDL60P 7707 3740 STORE 7708 5271 JMP RDL60P 7709 5370 STORE 7708 5271 JMP RDL60P 7710 2340 ISZ ADDR /STORE THE WORD READ FROM TAPE 7710 2340 ISZ ADDR /STORE THE WORD READ FROM TAPE 7710 2340 ISZ ADDR /STORE THE WORD READ FROM TAPE 7710 2340 ISZ ADDR /SKIP AFTER LAST MORD TO RE STORED IS READ 7712 5271 JMP RDL60P 7713 7100 CLL 7714 5271 JMP RDL60P 7716 6734 /TSRS /TAPE STATUS TO AC 7717 7720 5323 JMP ERRCK 7721 5323 JMP ERRCK 7721 1336 TAD ERRCK 7722 5327 JMP STORE /SKIP ON BAD PARITY 7720 5323 JMP ERRCK 7721 5326 JMP I READ 7722 5327 JMP STORE 7724 5326 JMP READ 7725 5662 JMP 1 FEAD 7726 7240 STERR, CLA CMA /SIZE EMROR STOP, AC=2222 7727 5662 JMP STORE 7731 2 COUNT. 7733 2250 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 CC11, 7766 7735 176 CC7601, 0176 7736 7736 176 CC7601, 0176 7737 0 COUNT. 0000 7741 7767 M11. 7767 7742 7776 C221 2222 7737 0 COUNT. 7767 7743 7746 IDENC. 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 10ENO. 7746 7746 1DENC. 7746 7747 7776 C. 7740 7740 0 ADDRIL CD000 7741 7767 7745 0 IDENO. 7746 7746 0 ADDRIL CD000 7747 1 PROFER PLACES. 7745 7745 0 IDENO. 7746 7746 0 ADDRIL CD000							
7671 6722 RDL00P, TSSR 7672 5271 JPP ," 7673 6721 JPP							Z TO BUTUALLY STORE
7672 527 JMP			DDI 660			BOILD	
7673 6721 TSDF 7674 5315 JPR ENDREC 7675 6715 DBRD, TSBD 7676 2337 7677 5301 JPR .*2 7700 5326 JPR SZERR 7701 7430 SZL 7701 7430 SZL 7702 5307 JPR STORE 7703 2354 157 LDFRST /SKIP WHEN READY TO START STORING 7704 5271 JPR RDLOOP 7705 7120 STL 7706 5712 JPR RDLOOP 7707 3740 STORE, DCA 1 ADDR /STORE THE WORD READ FROM TAPE 7710 2340 152 ADDR 7711 2350 152 LDLAST /SKIP AFIER LAST WORD TO RE STORED IS READ 7711 2350 152 LDLAST /SKIP AFIER LAST WORD TO RE STORED IS READ 7712 2350 152 LDLAST /SKIP AFIER LAST WORD TO RE STORED IS READ 7711 2350 152 LDLAST /SKIP AFIER LAST WORD TO RE STORED IS READ 7712 2351 JMP RDLOOP 7715 7200 CLL 7714 2971 JMP RDLOOP 7715 7200 SMA GLA /SKIP ON BAD PARITY 7720 5323 JMP RDLOOP 7721 3327 JMP STORE THE WORD READ FROM TAPE 7717 7720 SS23 JMP ERRCK STOP /PARITY ERROR STOP, AC=2222 7722 3327 JMP L222 7723 2337 ERRCK, ISZ COUNT 7724 2126 JMP TREAD 7726 7240 STORI, HLT /ERROR STOP - HIT CONTINUE TO TRY AGAIN 7731 7200 JMP STORI 7732 5002 JMP STORI 7733 2570 C2570 2570 /COMMAND CODE FOR SPACING 7734 7706 CG1, 7706 7735 170 CCOUNT, 0000 7741 7707 M11 7707 7742 7770 M11 7707 7743 7740 IDENO. 7740 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 7740 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 7740 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7746 0 ADDRI. C000			RULOUFF			. * 1	
7674 5315		,		-		• '	
7676 2337 15Z COUNT 7677 5301 JMP				JMP		ENDREC	
7707 5301			DBRD.				
7700 5326				-			•
7700 7430 \$ZL				-			
7702 5307							ASUPPRESS STARING UNTIL IST DESIRED WORD
7703 2354				_			the tribute and the survey has been been come the first of the
7704 5271 JMP RDLOOP 7705 7120 STL 7706 5271 JMP RDLOOP 7707 3740 STORE, DCA 1 ADDR 7710 2340 STORE, DCA 1 STZ ADDR 7711 2355 ISZ ADDR 7712 2355 ISZ ADDR 7713 7100 CLL 7714 5271 JMP RDLOOP 7715 7200 STARE 7716 6734 TSRS 7716 6734 TSRS 7717 7740 SMA GLA 7718 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP; /PARITY ERROR STOP, AC=2222 7722 5327 JMP STOP; /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 5326 JMP I READ 7725 5602 JMP T READ 7726 7240 SZERR. CLA CMA /SIZE ERROR STOP, AC=7777 7730 5200 JMP START 7731 2 C0002, JMP START 7731 2 C0002, JMP START 7732 5310 C0550, D530 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 COIL, 7766 7735 176 CCTOR) 7740 IN ADDR: 0000 7741 IN ADDR: 0000 7741 IN ADDR: 7776 7742 7776 M2. 7776 7743 7746 IDLOC. 7746 / ONE HORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 7746 IDLOC. 7746 / ONE HORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 7746 IDLOC. 7746 / ONE HORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 1DENO. 0000 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE	-			-			SKIP WHEN READY TO START STORING
7705 7120							THE PROPERTY OF THE PROPERTY O
7706 527 JMP RDLOOP 7717 3740 STORE, DCA I ADDR 7710 2340 152 ADDR 7711 2355 15Z LDLAST /SKIP AFTER LAST WORD TO BE STORED IS READ 7711 2355 15Z LDLAST /SKIP AFTER LAST WORD TO BE STORED IS READ 7713 7100 CLL 7714 5271 JMP RDLOOP 7715 7200 ENDREC, CLA 7717 7700 SMA CLA /SKIP ON BAD PARITY 7720 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP /PARITY ERROR STOP, AC=2222 7722 5327 JMP STOP /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 5262 JMP 1 READ 7726 7240 SZERR, CLA CMA /SIZE ERROR STOP, AC=7777 7727 7402 STOP HLT /ERROR STOP HIT CONTINUE TO TRY AGAIN 7731 2 CO0022 DO02 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7733 12 COUNT, DO00 7734 7766 CCI 1, 7766 7735 176 CC7601 DI76 7736 2222 L2222 2222 7737 7740 IN ADDR 2 DO00 7741 7767 M2. 7766 7742 7766 M2. 7766 7743 7746 IDLAG. 7746 7745 DICHOOL OND ADDR 1, CO00 /ADDR 1, ADDR 2, LDFRST. LDLAST INTO PROPER PLACES. 7746 DADDR 1, CO00 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE				-		- -	
7707 3740 STORE, DCA 1 ADDR /STORE THE WORD READ FROM TAPE 7710 2340 TISZ ADDR 7711 2355			-			RDLOOP	
7710 2340 15Z ADDR 7711 2355 15Z LDLAST /SKIP AFTER LAST WORD TO BE STORED IS READ 7712 5271 JMP RDLOOP 7713 7100 CLL 7714 5271 JMP RDLOOP 7715 7200 ENDREC, CLA 7716 6734 TSRS /TAPE STATUS TO AC 7717 7700 SMA CLA 7717 7700 SMA CLA 7720 5523 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP; /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 5126 JMP 1*2 7725 5662 JMP 1*2 7727 7402 STOP; HLT /ERROR STOP, AC=7777 7727 7402 STOP; HLT /ERROR STOP, AC=7777 7727 7402 STOP; HLT /ERROR STOP = HIT CONTINUE TO TRY AGAIN 7731 2 CO002; D002 /COMMAND CODE FOR REWIND 7732 5310 CD530, D530 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 CC11, 7766 7735 176 CC7601, 0176 7736 2222 L2222, 2222 7737 0 COUNT, 0000 7741 7767 M1: 7767 7742 7776 M2, 7776 7743 7746 IDLAC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLAC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLAC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLAC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLAC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7745 0 IDENO, 0000 / PROPER PLACES. 7745 0 IDENO, 0000 / PROPER PLACES. 7746 0 ADDRI, 0000 / ACTUALLY A DUMMY LOC, NOTHING HEAD INTO HERE	7707		STORE.	-	I	ADDR	STORE THE WORD READ FROM TAPE
7712 5271 JMP RDLOOP 7713 7100 7714 5271 JMP RDLOOP 7715 7200 ENDREC, CLA 7716 6734 7717 7700 SMA GLA /SKIP ON BAD PARITY 7720 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP1 /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 5326 JMP I READ 7725 5662 JMP I READ 7727 7402 STOP1, HLT /ERROR STOP = HIT CONTINUE TO TRY AGAIN 7727 7402 STOP1, HLT /ERROR STOP = HIT CONTINUE TO TRY AGAIN 7731 2 CO0022 D002 /COMMAND CODE FOR REMIND 7732 530 C0530, 0530 /COMMAND CODE FOR REMIND 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 OC11, 7766 7735 176 OC7601, 0176 7736 2222 L2222 2222 7737 0 COUNT, 0000 7741 767 M11, 7767 7742 7776 M2, 7776 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG. 7745 0 IDENO, 0000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE 7745 0 IDENO, 0000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE				-			
7713 7100 7714 5271 7715 7200 7716 6734 7717 7700 7710 SMA CLA SKIP ON BAD PARITY 7720 5323 7721 1336 7722 5327 7722 5327 7723 2337 ERRCK, ISZ COUNT 7724 5326 7725 5602 7726 7240 SZERR, CLA CMA SIZE ERROR STOP, AC=2222 7727 7402 STOP), HLT START 7737 75020 7737 7502 C0002, D002 /COMMAND CODE FOR READING 7738 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 0C11, 7766 7735 760 C2570, 2570 /COMMAND CODE FOR READING 7736 2222 L2222, 2222 7737 0 C0UNT, D000 7741 7767 MIL. 7767 7741 7767 MIL. 7767 7742 7776 M2. 7776 7743 7746 IDLOC, 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7745 0 IDENO, D000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE 7745 0 IDENO, D000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE							/SKIP AFTER LAST WORD TO BE STORED IS READ
7714 5271 JMP RDLOOP 7716 6734 7717 77U0 SMA CLA 7717 77U0 SMA CLA 7717 77U0 SMA CLA 7718 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP1 /PARITY ERROR STOP, AC=2222 7722 5327 JMP STOP1 /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 5326 JMP I READ 7725 5602 JMP I READ 7726 7240 SZERR, CLA CMA /SIZE ERROR STOP, AC=7777 7727 7402 STOP1, HLT /ERROR STOP = HIT CONTINUE TO TRY AGAIN 7730 5200 JMP START 7731 2 COURS. 7731 2 COURS. 7732 530 CDS30, D530 /COMMAND CODE FOR REWIND 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7733 770 COURS. 7734 7766 dC11, 7766 7735 176 dC7601, 0176 7736 2222 L2222, 2222 7737 0 COUNT. 7740 II ADDR, DOOD 7741 7767 MII. 7767 7742 7776 M2. 7776 7743 7746 IDLMC, 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7745 0 IDEMO, DOOD 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7745 0 IDEMO, DOOD 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7746 0 ADDRI, DOOD 7747 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7745 0 IDEMO, DOOD 7746 0 ADDRI, ADDR2, LDFRST, LDLAST_INIO				-		RDLOOP	
7715 7200 ENDREC, GLA 7716 76734 7585 /TSPS 7716 76734 7585 /TSPE 7717 77U0 SMA GLA 7717 77U0 SMA GLA 7717 77U0 SMA GLA 7721 5323 7721 1336 7721 1336 7722 5327 7722 5327 7723 2337 ERRCK, ISZ COUNT 7724 5326 7725 5662 7726 7240 SZERR, CLA CMA 781ZE ERROR STOP, AC=2222 7727 7402 STOP; HLT 7737 5200 7737 5200 7738 5200 7739 5200 7739 5200 7739 62002, 0002 /COMMAND CODE FOR REWIND 7730 5200 7731 2 CQ002, 0002 /COMMAND CODE FOR SPACING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 0C11, 7766 7735 176 0C7601, 0176 7736 2222 L2222, 2222 7737 0 COUNT, 0000 7740 0 ADDR, 0000 7741 7767 M11, 7767 7742 7776 M2, 7776 7743 7746 IDLAC, 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. 7745 0 IDEMO, 0000 7745 0 IDEMO, 0000 7746 0 ADDR, 0000 7747 0 ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE 7746 0 ADDR, 0000						00.00	gar y comments and the second of the second
7717 77U0 SMA GLA /SKIP ON BAD PARITY 7720 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP; /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 2326 JMP I READ 7725 5662 JMP I READ 7726 7240 SZERR, CLA CMA /SIZE ERROR STOP, AC=7777 7727 7402 STOP; HLT /ERROR STOP == HIT CONTINUE TO TRY AGAIN 7730 5200 JMP START 7731 2 COUCL, DOUZ /COMMAND CODE FOR REWIND 7732 530 CO530, D530 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 OC11, 7766 7735 176 OC7601, D176 7736 2222 L2222, 2222 7737 0 COUNT, DOUG 7740 II ADDR, DOUG 7741 7767 MIL 7767 7742 7776 M2, 7776 7743 7746 IDL#C, 7746 / ONE MORE THAN ST ID, LOC. TO MAKE THIS PROG. **** ****			CHRREC	-		KDEOGP	
7717 77U0 SMA GLA /SKIP ON BAD PARITY 7720 5323 JMP ERRCK 7721 1336 TAD L2222 7722 5327 JMP STOP /PARITY ERROR STOP, AC=2222 7723 2337 ERRCK, ISZ COUNT 7724 2326 JMP I READ 7725 5662 JMP I READ 7727 7402 STOP , HLT /ERROR STOP HIT CONTINUE TO TRY AGAIN 7730 52U0 JMP START 7731 2 COUCL. DOUL /COMMAND CODE FOR REWIND 7732 530 CO530, D530 /COMMAND CODE FOR READING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 COIL, 7766 7735 176 CC7601, D176 7736 2222 L2222, 222 7737 0 CGUNT, DOUL 7740 II ADDR, DOUL 7741 7767 MIL 7767 7742 7776 M2, 7776 7743 7746 IDLOC, 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. 7745 0 IDENO, DOUL 7745 0 IDENO, DOUL 7746 0 ADDRI, COULD 7746 0 ADDRI, COULD 7746 0 ADDRI, COULD 7747 0 IDENO, DOULD 7748 0 IDENO, DOULD 7749 0 IDENO, DOULD 7749 0 IDENO, DOULD 7745 0 IDENO, DOULD 7746 0 ADDRI, COULD 7746 0 ADDRI, COULD 7747 0 ADDRI, COULD 7748 0 ADDRI, COULD 7749 0 ADDRI, COULD 7749 0 ADDRI, COULD 7745 0 IDENO, DOULD 7746 0 ADDRI, COULD 7746 0 ADDRI, COULD 7747 0 ADDRI, COULD 7748 0 ADDRI, COULD 7749 0 ADDRI, COULD 7749 0 ADDRI, COULD 7740 0 ADDRI, COULD 7740 0 ADDRI, COULD 7745 0 ADDRI, COULD 7745 0 ADDRI, COULD 7746 0 ADDRI, COULD 7746 0 ADDRI, COULD 7747 0 ADDRIA COULD 7748 0 ADDRIA COULD 7749 0 ADDRIA COULD 7749 0 ADDRIA COULD 7740 0 ADDRIA COULD 7	7776	6734	ENDUECI	TSR	S		TAPE STATUS TO AC
7721 1336 7722 5327 7723 2337 ERRCK, ISZ COUNT 7724 5326 7725 56602 7726 7240 SZERR. CLA CMA 7727 7402 STOP; HLT 7727 7402 STOP; HLT 7730 5200 7731 2 COUO2; DOO2 7732 530 CD530, D530 7733 2570 C2570, 2570 7734 7766 dC 7734 7766 dC 7735 176 dC760 7736 2222 L2222, 2222 7737 0 COUNT, DOO0 7740 0 ADDR; COO0 7740 7776 M2, 7776 7741 7767 7742 7776 M2, 7776 7743 7746 IDL#C, 7746 7745 0 IDEMO, OROO 7745 0 ADDR!, COO0 7746	7717	7700		SMA	CLA		SKIP ON BAD PARITY
7723 2337 ERRCK, ISZ CÖUNT 7724 5326 7725 5662 JMP 1 READ 7726 7240 SZERR. CLA CMA		-		-			
7723 2337 ERRCK, ISZ CÖUNT 7724 5326 7725 5662 JMP 1 READ 7726 7240 SZERR. CLA CMA						L2222	ADIDITY EDGED CTED ACEDORS
7724 5326 7725 5662 JMP I READ 7726 7240 SZERR. CLA CMA	//22	232/		JHP		3.05	ALMUTTE EURON STOLT MA-5555
7725 5662	7723	2337	ERRCK.	ISZ		COUNT	
7725 5662	7724	5326	•	JMP		.+2	
7727 7402 STOP; HLT				JMP	7	READ	
7727 7402 STOP; HLT	-		07500		~~.		ACTTO CODED CTAR AFETTT
7730 5200 JMP START / 7731 2 C0002, D002 /COMMAND CODE FOR REWIND 7732 530 C0530, D530 /COMMAND CODE FOR SPACING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 DC11, 7766 7735 176 DC7601, D176 7736 2222 L2222, 2222 7737 0 COUNT, D000 7740 0 ADDR, D000 7741 7767 M11, 7767 7742 7776 M2, 7776 7743 7746 IDLAC, 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. / READ ADDRI, ADDR2, LDFRST, LDLAST_INIO / PROPER PLACES. *7745 7745 0 IDENO, D000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE 7746 0 ADDR1, C000					UMA		
773 2 CQ002: 0002 /COMMAND CODE FOR REWIND 7732 530 C0530, 0530 /COMMAND CODE FOR SPACING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 OC : 7766 7735 176 OC760: 0176 7736 222 L222: 222 7737 0 COUNT, 0000 7740 0 ADDR, 0000 7741 7767 M1: 7767 7742 7776 M2, 7776 7743 7746 IDLOC, 7746 / ONE MORE THAN IST ID, LOC, TO MAKE THIS PROG. / READ ADDR: ADDR: LDFRST, LDLAST_INIO / PROPER PLACES. *7745 7746 0 IDENO, 0000 /ACTUALLY A DUMMY LOC, NOTHING READ INTO HERE 7746 0 ADDR: C000			210611	-			VERKOR SIGH S. HII COMITMOF ID INA VOVIM
7732 530 CD53D, D53D /COMMAND CODE FOR SPACING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 DC11, 7766 7735 176 DC76D1, D176 7736 2222 L222, 2222 7737	/73 n	2500		JMP		SIAKI	
7732 530 CD53D, D53D /COMMAND CODE FOR SPACING 7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 DC11, 7766 7735 176 DC76D1, D176 7736 2222 L222, 2222 7737	772.		<u>/</u>	0000		/COMMAND	CADE COR REWIND
7733 2570 C2570, 2570 /COMMAND CODE FOR READING 7734 7766 CC 7766 7735 176 CC760 0176 7736 2222 L2222 2222 7737							
7734 7766 dC 7766 7735 176 dC760 0 176 7736 222 L222 2222 7737 0 CdUNT, 0000 7740 ADDR, 0000 7741 7767 7767 7742 7776 7767 7743 7746 IDL#C, 7746 / ONE MORE THAN ST ID, L&C, TO MAKE THIS PROG. READ ADDR ADDR LDFRST LDLAST INTO PROPER PLACES. *7745 1DENO, 0000 /ACTUALLY A DUMMY L&C, NOTHING READ INTO HERE 7746 0 ADDR COOO				•			
7735 176 dC76g1, g176 7736 2222 L222; 2222 7737				_		,	none i et impresita
7736 2222 L222: 2222 7737			•				
7737 0 COUNT, 0000 7740 0 ADDR, 0000 7741 7767 MI; 7767 7742 7776 M2; 7776 7743 7746 IDLOC, 7746 / ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG.							
7740 II ADDR, 0000 7741 7767 M11. 7767 7742 7776 M2. 7776 7743 7746 IDL#C, 7746 / ONE MORE THAN 1ST ID, LOC. TO MAKE THIS PROG. READ ADDRI. ADDR2. LDFRST. LDLAST INTO PROPER PLACES. *7745 7746 0 IDENO. 0000 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE 7746 0 ADDR1. COOD							
7741 7767 MII. 7767 7742 7776 M2, 7776 7743 7746 IDL#C, 7746				-			
7743 7746 IDL#C, 7746 / ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG. / READ ADDRI. ADDR2 LDFRST. LDLAST INTO / PROPER PLACES. *7745 7746 0 ADDR1, 0000 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE 7746 0 ADDR1, 0000	•		MII				
/ READ ADDRI, ADDR2: LDFRST, LDLAST_INTO / PROPER PLACES. *7745 0 IDENO, 0000 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE 7746 0 ADDRI, 0000							TOTAL CONTRACTOR OF THE AREA OF THE CONTRACTOR O
/ PROPER PLACES. *7745 7745 0 IDENO. 0000 /ACTUALLY A DUMMY LOC NOTHING READ INTO HERE 7746 0 ADDRI. 0000	7743	7746	intac.	7746			ONE MORE THAN IST ID, LOC. TO MAKE THIS PROG.
#7745 7745 0 IDENO: 0000 /ACTUALLY A DUMMY LOC: NATHING READ INTO HERE 7746 0 ADDRI: 0000							
7745 O IDENO, ONDO ZACTUALLY A DUMMY LOC NATHING READ INTO HERE 7746 O ADDRI. COOD			#77AE				/ PROFER PLAUES.
7746 0 ADDRI, 0000	7745	n		0.004			VACTUALLY A DUMMY LEC MATHEME BEAD INTO HERE
		-					Audiostic a moduli toos unidida ueso sulo delle
		-		-			

7750 0	l	0000
7751	I	0000
7752		0000
7753	1	0000
7754	LDFRST,	0000
7755 1	LDLAST,	0000
SYMBOL TAE)LF	
AODR	7740	
ADDRI	7746	
ADDR2	7747	
C0002	7731	
C0530	7732	
C2570	7733	
COUNT	7737	
DBRD	7675	
ENDREC	7715	
ERRCK	7723	
IDENO	7.745	E 1
IDLOC	7743 7736.	
L2222 LDFRST	7754	
- '	7755	
MII	7741	
M2	7742	
0C11	7734	
- 6C7601	7735	
RDLOOP	7671	
READ	7662	
READY	7653	
START	7600	
STOPI	772 7	
STORE	7707	
SZERR	7726	
DUPLICATE	TAGS	
NONE		

UNDEFINED SYMBOLS

ORNL TM-1805

Internal Distribution

1-3.	L. S. Abbott	21. B. W. Rust
4.	C. L. Allen (CTC)	22. L. W. Weston
	F. E. Bertrand	23. G. Dessauer (consultant)
6.	A. A. Brooks (CTC)	24. B. C. Diven (consultant)
7 - 9•	W. R. Burrus	25. M. H. Kalos (consultant)
10.	R. E. Funderlic (CTC)	26. L. V. Spencer (consultant)
11.	T. A. Love	27-28. Central Research Library
12.	F. Madden	29. Document Reference Section
	F. C. Maienschein	30-230. Laboratory Records Department
14.	E. McDaniel	231. Laboratory Records ORNL RC
15-19.	R. W. Peelle	232. ORNL Patent Office
20.	F. G. Perey	

External Distribution

233-247. Division of Technical Information Extension (DTIE) 248. Division of Research and Development (ORO)